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## ***Hybrid Core-Shell Nanoparticles as Multifunctional Tools in Brain Cancer Theranostics***

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### ***Introduction***

Glioblastoma multiforme (GBM) is the most common primary brain tumor in adults. Because of its aggressive and infiltrative nature, efficient treatment with systemic chemotherapy remains a major challenge<sup>1</sup>.

In this work, hybrid core-shell polymer nanoparticles (PNPs) for concomitant loading of multiple payloads and imaging agents were designed and characterized for the intracranial (i.c.) drug delivery in GBM.

### ***Experimental Methods***

PNPs were prepared via a nanoprecipitation/self-assembly method to obtain a hybrid structure composed of a cell membrane-friendly lipid outer shell for long circulation and ready conjugation with imaging agents and a polymer core of multi-block polyurethanes (PURs) to host multiple payloads.

PNPs labeled with an infra-red dye and loaded with a fluorescent molecule simulating a therapeutic payload, were i.c. administered in highly infiltrative GBM model<sup>2</sup> and their transport kinetics were investigated using different 2D/3D imaging techniques.

### ***Results***

PNPs showed high loading efficiency and remarkable imaging capabilities, showing high selectivity as MRI contrast agents as well as a high Contrast to Noise Ratio (CNR) in fluorescent/photoacoustic imaging<sup>3</sup>.

PURs PNPs demonstrated potential to combine imaging and therapy, high tissue penetration ability, long-term retention inside the brain, warranting further investigation as theranostic nanocarriers in GBM.

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